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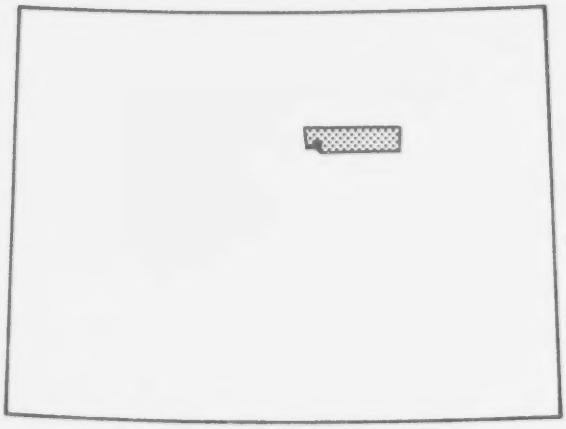
FEMA 209:080006/988

FLOOD INSURANCE STUDY

CITY OF COMMERCE CITY, COLORADO
ADAMS COUNTY



REVISED
SEPTEMBER 30, 1988

Federal Emergency Management Agency

COMMUNITY NUMBER - 080006

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

This publication incorporates revisions to the original FIS. These revisions are presented in Section 9.0.

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FLOOD INSURANCE STUDY
CITY OF COMMERCE CITY, ADAMS COUNTY, COLORADO

1.0 INTRODUCTION

1.1 Purpose of Study

The purpose of this Flood Insurance Study is to investigate the existence and severity of flood hazards in the City of Commerce City, Adams County, Colorado and to aid in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. Initial use of this information will be to convert Commerce City to the regular program of flood insurance by the Federal Insurance Administration. Further use of the information will be made by local and regional planners in their efforts to promote sound land use and floodplain development.

1.2 Coordination

Community base map selection, topographic mapping, and the identification of streams requiring detailed study were accomplished in a meeting attended by personnel of Gingery Associates, Inc., the Federal Insurance Administration, the Urban Drainage and Flood Control District, and local officials of Commerce City on February 12, 1976.

The final community coordination meeting was held on March 7, 1977, at which time the final results of the Flood Insurance Study were presented to city officials and residents. An explanation of the National Flood Insurance Program was made by a representative of the Federal Insurance Administration, and the results of the Flood Insurance Study were presented by Gingery Associates, Inc. There were no problems or objections to the study.

1.3 Authority and Acknowledgments

The source of authority for this Flood Insurance Study is the National Flood Insurance Act of 1968, as amended. The hydrologic and hydraulic analyses for this study were performed by Gingery Associates, Inc., for the Federal Insurance Administration, under Contract No. H-3716. This work, which was completed in March 1977, covered all signiticant flooding sources affecting Commerce City.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the City of Commerce City, Adams County, Colorado. The area of study is shown on the Vicinity Map (Figure 1).

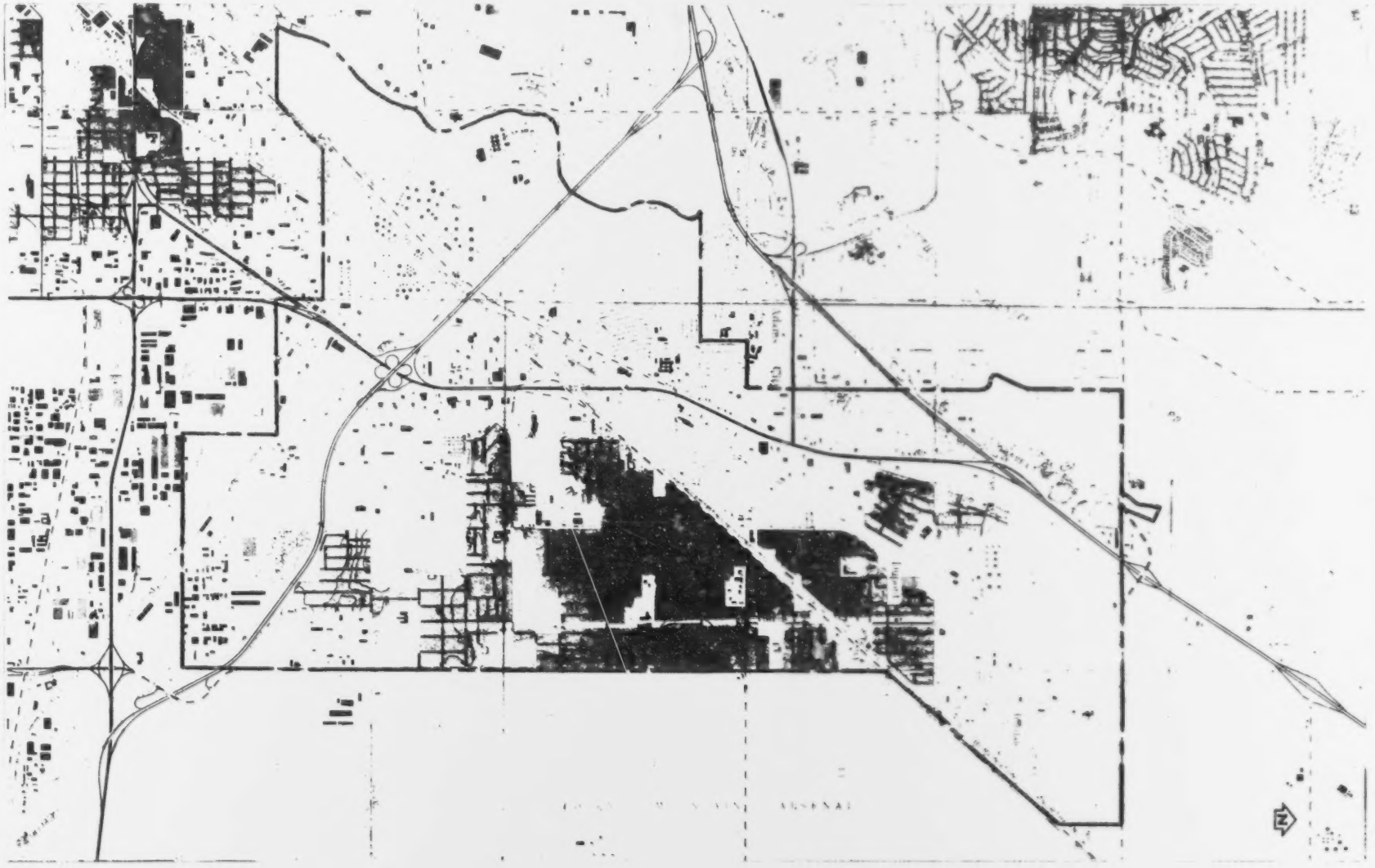

FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF COMMERCE CITY, CO
(ADAMS CO.)

APPROXIMATE SCALE

4000 0 4000 8000 12000 FEET

VICINITY MAP

Floods caused by overflow of the South Platte River and Sand Creek were studied in detail. The areas studied in detail were chosen with consideration given to all forecasted development until 1980.

2.2 Community Description

Commerce City is situated in the southwestern corner of Adams County, a centrally located county in Colorado. The city is 15 miles south of Brighton, the county seat. Denver's Stapleton International Airport and the U.S. Army's Rocky Mountain Arsenal border the city on the east. The City and County of Denver, the state capital, forms the southern boundary, and Adams County adjoins the city to the north and west.

Commerce City was first incorporated in December of 1952 and named Commerce Town. The population increased 750% from 1200 persons in 1952 to 9000 persons in 1960 at which time Commerce Town became Commerce City. As of 1975, the city had a population of approximately 18,700 persons.

Commerce City is characterized by broad, gently rolling terrain. The South Platte River flows from south to north, draining the western part of the city. The main drainageway through the center of Commerce City is Sand Creek, which flows from the southeast, northwesterly to its confluence with the South Platte River just south of Interstate 270 at the western corporate limit. The South Platte River ranges in elevation from 5,128 feet at the southern limit to 5,091 feet at the northern boundary. Sand Creek ranges from 5,215 feet at the southeastern corporate limit to 5,096 feet at the confluence with the South Platte River. The vegetation in the floodplain areas is predominately grama-buffalo grasses and some scattered native box elders and cottonwood trees.

The city's climate generally is similar to that of the high plains. It has a wide daily range in temperature with a yearly normal daily maximum of 64°F and a minimum of 33°F, with approximately 15 inches of annual precipitation.

The soils in the South Platte and Sand Creek channel areas are predominately a sandy loam soil with moderate infiltration. Development within the floodplains, which is mostly industrial, has been limited due to the poor structural properties of the soils in the floodplains. Although with the increasing value of land, development pressures are also increasing within floodplains and if permitted, could result in increased flood heights and destruction.

2.3 Principal Flood Problems

Major floods have occurred on the South Platte River and Sand Creek since 1844. During that period, 11 floods have occurred on the South Platte and 10 notable floods have occurred on Sand Creek.

The most significant floods of recent times on the South Platte River occurred in 1912, 1921, 1935, 1942, 1965, and 1973 for which discharges of 13,000 cubic feet per second (cfs), 8,790 cfs, 22,000 cfs, 12,320 cfs, 10,200 cfs, 40,300 cfs, and 33,000 cfs, respectively, were recorded at the Denver gage. The floods of 1896, 1912, 1917, 1921, 1933, and 1938 on Sand Creek were not recorded in regards to specific discharges. Measurements were made to estimate the discharges for the following years: 1948, 10,500 cfs at the mouth; 1957, 25,500 cfs at Yosemite Street; 1965, 18,900 cfs just downstream of Toll Gate Creek; and 1973, 5,630 cfs at East 49th Drive.

The major cause of floods on the South Platte River and Sand Creek are cloudbursts or intensive rainstorms which normally occur during the period of May through August. The South Platte River flooding also is aggravated by snow melt on the tributary streams during the rainstorm period.

There are two areas of shallow sheet flow within the community, both of which are along Sand Creek. The upstream area is on the southwest side of Sand Creek between the corporate limits and 49th Drive. In this area, the ground slopes away from the channel and the flow cannot return. The second area is under Interstate 270 at the two railroad underpasses to the northwest. During a large flood event, the flood waters will pass under the interstate bridge and flow along the low ground away from the channel.

In 1965, a unique combination of orographic effects and meteorological conditions in the South Platte River basin caused the worst flooding in the region's recorded history. Severe thunderstorms commenced over the headwaters of Plum Creek and Cherry Creek on June 16 and moved northeasterly down the creeks and augmenting peak flows. More than 14 inches of rain was recorded at Palmer Lake in 4 hours. Overnight, westerly winds moved the storm front to a position over Kiowa and Bijou Creek basins to meet with thunderstorms forming just south of Agate. Here 5.25 inches fell in 45 minutes. The net result was 6 persons drowned, 2 other deaths caused by flood-related activities, and estimated damages of $500 million in the South Platte River basin, of which $300 million occurred in the Denver area. Scenes of the 1965 flood in Commerce City are shown in Figures 2 through 9. The pictures were taken from photographic records of the Denver Post and Hotchkiss, Inc.

Figure 2. South Platte River, June 17, 1965. Truck Farms Inundated Looking North Toward the East 74th Avenue Bridge. The Burlington Ditch Is in Right Foreground. (Hotchkiss Inc. Photograph)

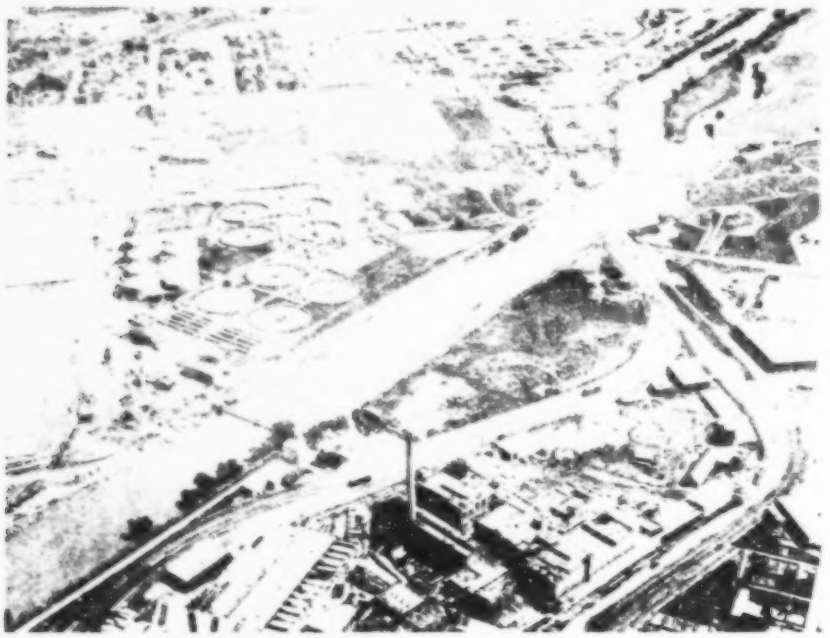

Figure 3. South Platte River, June 17, 1965. Note Franklin Street and Railroad Bridges Are Washed Out Near Commerce City. (Hotchkiss Inc. Photograph)

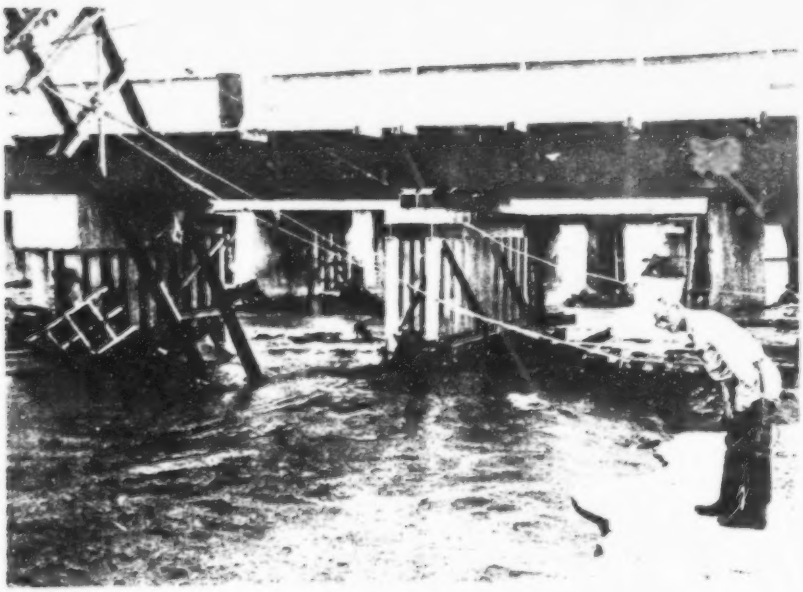

Figure 4. Sand Creek, July 25, 1965. Creek Rages Under the Union Pacific and Burlington Railroad Bridges East of Brighton Boulevard, Tearing Away Part of 60th Avenue in Right Foreground. (Denver Post Photograph)

Figure 5. Sand Creek, July 24, 1965. Creek Has Washed Out the Havana Street Bridge and Carried Large Sections of Storm Sewer Pipe Downstream. Note Errosive Effects on Banks in Background and Crumbling Roadbed on Left.

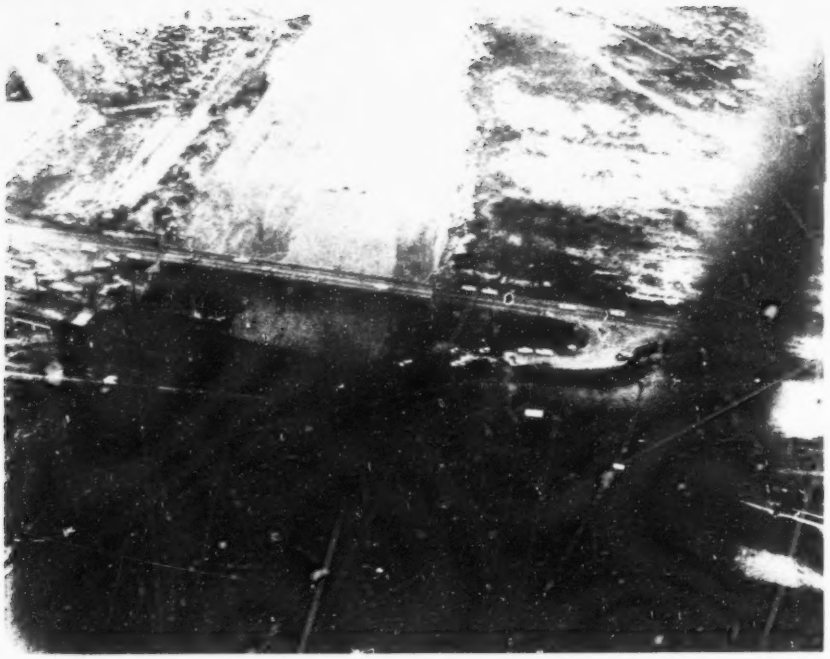

Figure 6. Sand Creek, June 17, 1965. Large Pile of Debris Heaped Against the Piers of the Union Pacific and Burlington Railroad and Brighton Boulevard Bridges. Note That 60th Avenue Has Been Washed Out.

Figure 7. Sand Creek, June 17, 1965. Dahlia Street Bridge Near East 56th Avenue Destroyed. Note Widespread Debris and Silt Deposition in Foreground.

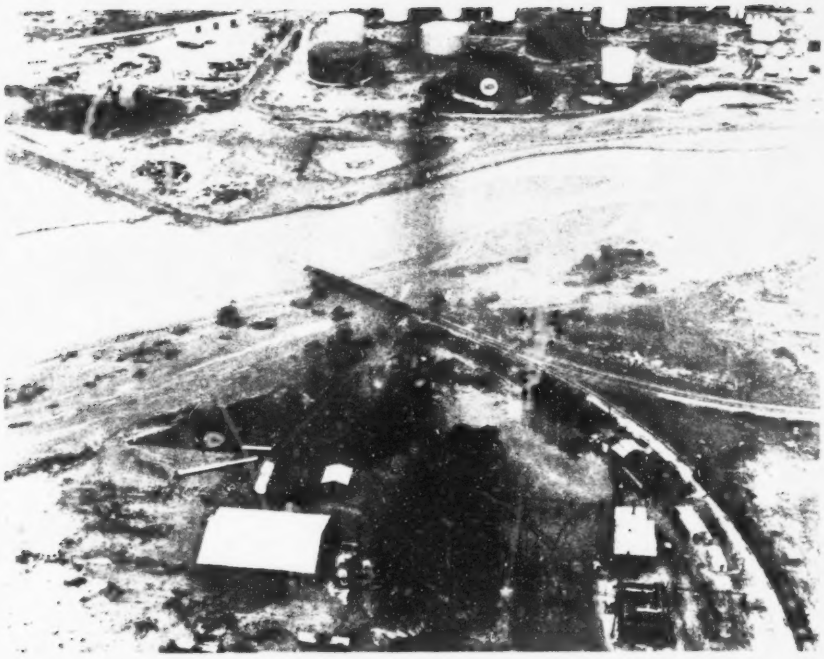

Figure 8. Sand Creek, June 17, 1965. Ties and Supporting Structures of the Burlington Railroad Bridge Near East 56th Avenue Ripped Away, Leaving the Rails Sagging in the Gap.

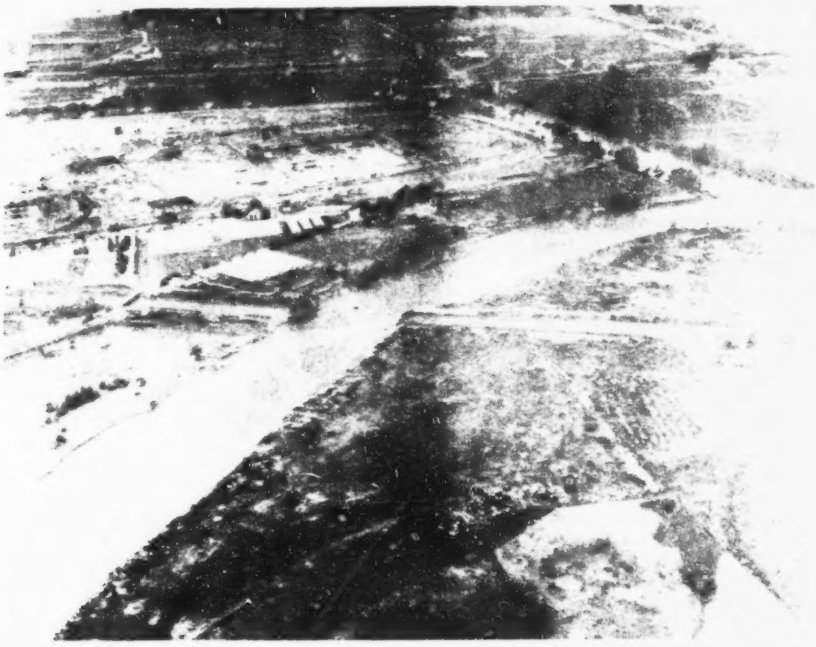

Figure 9. Sand Creek, June 17, 1965. Burlington Ditch Siphon Washed Out Just Upstream of the Confluence With the South Platte River.

2.4 Flood Protection Measures

With a history of major flooding on the South Platte River, the Denver metropolitan area saw a need for flood control structures, which has resulted in the construction of three major reservoirs and a levee system along the South Platte River.

In 1950, Cherry Creek Dam was constructed just upstream of Denver, located approximately 13 river miles from Commerce City, at a cost of $20 million. The dam is 14,300 feet wide and 140 feet high.

During the 1950s, planning and design for the Chatfield Dam flood control reservoir was completed, however, funding was not available to initiate and complete construction. Three hundred million dollars in property damage suffered in 1965 changed the minds of many, leading to project funding and construction. In 1973, final closure of the dam was made and the facility became capable of storing tributary flood waters. Chatfield Dam is located approximately 0.5 mile above the City of Littleton, Colorado, in Douglas and Jefferson Counties, approximately 18 river miles from Commerce City.

In addition to the Cherry Creek and Chatfield Dams, one additional flood control measure, the Bear Creek Dam, was envisioned in the early 1940s. The Bear Creek Dam is located in Jefferson County on the Bear Creek tributary approximately 16 river miles from Commerce City. Authorization for funding and design of the dam did not occur until 1968. Construction on the $68 million earthfill structure started in July 1974 and is scheduled to be operational in 1979. The dam will be 170 feet high and about 7,000 feet wide, having a storage capacity of 75,000 acre-feet, equivalent to the U.S. Army Corps of Engineers standard project flood.

Throughout the study segment of the South Platte River in Commerce City, levees have also been constructed as a flood protection measure. However, during floods of a 100-year frequency or larger, the levees are topped in the vicinity of the Interstate 270 bridge and the railroad.

Some channel improvements have been made to Sand Creek, including two drop structures which have some effect in reducing velocity, but there are no existing structural flood protection measures.

3.0 ENGINEERING METHODS

For flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Floods having recurrence intervals of 10, 50, 100, and 500 years have been selected as having special significance for floodplain management and for flood insurance premium rates. The analyses reported here reflect current conditions in the watersheds of the streams.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for floods of the selected recurrence intervals for each stream studied in detail in the community.

The discharges used in this study were provided by the U.S. Army Corps of Engineers, Omaha District, for the South Platte River. These discharge profiles were keyed to the 100-year flood values computed from the Denver and Henderson gaging records of the South Platte River, which were adjusted for the regulating effects of Chatfield, Cherry Creek, and Bear Creek Reservoirs. The Denver gage is located 5 miles upstream of Commerce City, and the length of gaging records was from 1895 to 1973, excluding 1902, 1907, and 1908. The Henderson gage is located 9.5 miles downstream of Commerce City, and the length of gaging station records used for the analysis was from 1926 to 1973.

The U.S. Army Corps of Engineers also provided the discharges used for Sand Creek. The hydrologic analysis of Sand Creek was based on the development of a surface runoff model of the Sand Creek basin using the runoff block of the Environmental Protection Agency's Storm Water Management Program (Reference 1). Discharge hydrographs developed from the model were then routed along the main stem of Sand Creek by use of an unsteady flow, routing procedure developed by James C. Harder and modified by the Missouri River Division Office of the U.S. Army Corps of Engineers. Discharge probability relationships were developed by inserting precipitation frequency values (Reference 2).

Peak discharges for the 10-, 50-, 100-, and 500-year floods for the South Platte River and Sand Creek in the study area are shown on Table 1.

Table 1. Summary of Discharges

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (Cubic Feet per Second) 10-Year	50-Year	100-Year	500-Year
South Platte River					
Franklin Street	3,820[1]	8,500	12,500	17,200	26,500
Upstream of Confluence with Sand Creek	3,830[1]	8,500	12,500	17,200	26,500
Interstate 76	4,025[1]	17,500	29,000	37,200	60,000
Sand Creek					
Quebec Street	189	10,500	23,300	30,000	33,000
Mouth at South Platte River	196	11,000	24,200	30,500	36,200

[1] Includes Area Above Chatfield, Bear Creek, and Cherry Creek Dams.

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of streams in the community were carried out to provide estimates of the elevations of floods of the selected recurrence intervals along each stream studied in detail. Cross section data for the South Platte River was obtained by field surveys and cross section data for Sand Creek was taken from aerial contour mapping (Reference 3). All bridges and culverts were surveyed or the information was provided by the Colorado Department of Highways to obtain elevation data and structural geometry. Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway is computed (Section 4.2), selected cross section locations are also shown on the Floodway Map (Exhibit 2).

Roughness coefficients (Manning's "n") were estimated by field inspection. The range of "n" values used for Sand Creek were from 0.025 to 0.045 and those for the South Platte River were from 0.035 to 0.070.

Water-surface profiles were developed using the HEC-2 step-backwater computer program (Reference 4). Profiles were determined for the 10-, 50-, 100- and 500-year floods. Flood profiles were drawn showing computed water-surface elevations to an accuracy of ±0.5 foot. All starting water-surface elevations for the South Platte River were taken from the Adams County, Colorado, Flood Insurance Study (Reference 5). The starting water-surface elevations for Sand Creek were those computed for the South Platte River at the confluence. All elevations are

referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in the study are shown on the maps.

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

A prime purpose of the National Flood Insurance Program is to encourage state and local governments to adopt sound floodplain management programs. Each Flood Insurance Study, therefore, includes a flood boundary map designed to assist communities in developing sound floodplain management measures.

4.1 Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by the Federal Insurance Administration as the base flood for purposes of floodplain management measures. The 500-year flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the boundaries of the 100-year and the 500-year floods have been delineated using the flood elevations determined at each cross section; between cross sections, the boundaries were interpolated by photogrammetric methods using topographic maps from aerial photos at a scale of 1:6,000, with a contour interval of 2 feet (References 3 and 6).

Areas of shallow sheet flow outside the aerial photomapping limits were delineated using a topographic map at a scale of 1:24,000 with a contour interval of 10 feet (Reference 7). Flood boundaries are indicated on the Flood Insurance Rate Map (Panel 0005). In this map, the 100-year boundary corresponds to the boundary of the areas of special flood hazards (Zones A6, A7, A9, A10, A12, and A13); and the 500-year boundary corresponds to the boundary of areas of moderate flood hazards (Zone B). In cases where the 100-year and 500-year flood boundaries are close together, only the 100-year boundary has been shown. Small areas within the flood boundaries may lie above the flood elevations, and therefore, not be subject to flooding; owing to limitations of the map scale, such areas are not shown.

4.2 Floodways

Encroachment on floodplains, such as artificial fill, reduces the flood-carrying capacity and increases flood heights, thus increasing flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the Flood Insurance Program, the concept of a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 100-year flood is divided into a floodway and a floodway fringe. The floodway is the channel of a

stream, plus any adjacent floodplain areas, that must be kept free of encroachment in order that the 100-year flood be carried without substantial increases in flood heights. As minimum standards, the Federal Insurance Administration limits such increases in flood heights to 1.0 foot, provided that hazardous velocities are not produced.

The floodway for this study was computed on the basis of equal conveyance reduction from each side of the floodplain for Sand Creek. The floodway for the South Platte River was developed by setting the limits along the levees. The results of these computations are tabulated at selected cross sections for each stream segment for which a floodway is computed (Table 2).

As shown on the Floodway Map (Exhibit 2), the floodway boundaries were determined at cross sections; between cross sections, the boundaries were interpolated.

In cases where the floodway and 100-year flood boundary are close together, only the floodway has been shown. In some areas, part of the floodway lies outside the corporate limits.

The area between the floodway and the boundary of the 100-year flood is termed the floodway fringe. The floodway fringe thus encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 10.

5.0 INSURANCE APPLICATION

In order to establish actuarial insurance rates, the Federal Insurance Administration has developed a process to transform the data from the engineering study into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors, and flood insurance zone designations for each flooding source studied in detail affecting the City of Commerce City.

5.1 Reach Determinations

Reaches are defined as lengths of watercourses having relatively the same flood hazard, based on the average weighted difference in water-surface elevations between the 10- and 100-year floods. This difference does not have a variation greater than that indicated in the following table for more than 20 percent of the reach.

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
South Platte River								
A	40[1]	3,360[2]	25,300	1.4	5,073.2	5,073.2	5,073.2	0.0
B	4,070[1]	217[2]	1,557	15.2	5,078.0	5,078.0	5,078.0	0.0
C	5,440[1]	445[2]	4,531	5.2	5,084.2	5,084.2	5,084.2	0.0
D	20,120[1]	1,048[3]	8,774	4.3	5,111.9	5,111.9	5,112.0	0.1
E	21,490[1]	274[3]	3,973	9.5	5,113.0	5,113.0	5,113.0	0.0
F	22,900[1]	231[3]	2,769	5.4	5,116.6	5,116.6	5,117.1	0.5
G	25,180[1]	200[3]	2,350	6.5	5,118.0	5,118.0	5,118.1	0.1
H	26,870[1]	200[3]	2,128	7.2	5,119.8	5,119.8	5,120.0	0.2
I	27,740[1]	215[3]	2,371	6.8	5,122.8	5,122.8	5,123.3	0.5
J	28,380[1]	200[3]	1,148	13.6	5,125.4	5,125.4	5,125.5	0.1
K	30,910[1]	247[3]	2,171	7.3	5,131.5	5,131.5	5,131.5	0.0
L	32,380[1]	418[3]	1,891	8.5	5,133.6	5,133.6	5,133.6	0.0
M	32,850[1]	239[3]	1,871	8.6	5,134.8	5,134.8	5,134.9	0.1
Sand Creek								
A	210[4]	234	--[5]	--[5]	5,114.8	5,114.8	5,114.8	0.0
B	720[4]	280	2,265	13.5	5,118.1	5,118.1	5,118.1	0.0
C	1,170[4]	255	2,819	10.8	5,121.4	5,121.4	5,121.4	0.0
D	1,380[4]	170	2,563	11.9	5,121.7	5,121.7	5,121.7	0.0
E	1,500[4]	240	5,198	5.9	5,132.3	5,132.3	5,132.3	0.0
F	2,030[4]	460	4,886	6.2	5,133.1	5,133.1	5,133.1	0.0
G	2,530[4]	403	3,458	8.8	5,133.3	5,133.3	5,133.5	0.2
H	2,970[4]	403	3,304	9.2	5,134.7	5,134.7	5,134.7	0.0
I	3,760[4]	300	2,937	10.4	5,138.3	5,138.3	5,138.3	0.0
J	4,100[4]	370	3,204	9.5	5,139.9	5,139.9	5,139.9	0.0
K	4,325[4]	321	2,887	10.6	5,140.5	5,140.5	5,140.5	0.0

[1]Feet above Corporate Limits [2]This Width Completely Outside Corporate Limits
[3]Width does not Include Islands in the Floodway [4]Feet above Confluence with South Platte River
[5]Not Computed

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF COMMERCE CITY, CO.
(ADAMS CO.)

FLOODWAY DATA

SOUTH PLATTE RIVER - SAND CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Sand Creek (Continued)								
L	4,445	321	4,298	7.1	5,149.1	5,149.1	5,149.1	0.0
M	4,530	349	4,297	7.1	5,149.2	5,149.2	5,149.2	0.0
N	4,700	448	4,875	6.3	5,151.9	5,151.9	5,151.9	0.0
O	4,990	300	4,150	8.1	5,152.0	5,152.0	5,152.0	0.0
P	5,350	332	4,140	8.7	5,152.6	5,152.6	5,152.6	0.0
Q	5,730	279	4,006	9.8	5,153.0	5,153.0	5,153.0	0.0
R	6,280	445	5,156	7.4	5,154.4	5,154.4	5,154.8	0.4
S	6,740	472	5,575	6.0	5,158.0	5,158.0	5,158.6	0.6
T	7,290	468	4,390	8.0	5,158.7	5,158.7	5,159.2	0.5
U	7,800	346	4,205	8.2	5,159.9	5,159.9	5,160.4	0.5
V	7,930	292	2,029	15.0	5,162.5	5,162.5	5,162.5	0.0
W	8,150	440	3,078	9.9	5,163.5	5,163.5	5,163.5	0.0
X	8,840	516	3,964	7.7	5,168.5	5,168.5	5,168.5	0.0
Y	9,100	344	3,443	8.9	5,169.0	5,169.0	5,169.0	0.0
Z	9,180	358	3,523	8.7	5,169.2	5,169.2	5,169.2	0.0
AA	9,620	496	4,352	7.0	5,170.7	5,170.7	5,170.7	0.0
AB	10,240	389	3,906	7.8	5,171.7	5,171.7	5,171.7	0.0
AC	10,920	206	2,094	14.6	5,172.4	5,172.4	5,172.4	0.0
AD	11,220	311	3,141	9.7	5,175.8	5,175.8	5,175.8	0.0
AE	11,940	429	4,828	6.2	5,177.8	5,177.8	5,177.8	0.0
AF	12,020	239	1,873	16.0	5,181.0	5,181.0	5,181.0	0.0
AG	12,220	495	4,475	6.7	5,185.1	5,185.1	5,185.1	0.0
AH	12,490	638	4,806	6.2	5,185.5	5,185.5	5,185.5	0.0
AI	13,040	635	5,384	5.6	5,186.4	5,186.4	5,186.4	0.0
AJ	13,520	624	3,614	8.3	5,188.3	5,188.3	5,188.3	0.0

[1]Feet above Confluence with South Platte River

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF COMMERCE CITY, CO.
(ADAMS CO.)

FLOODWAY DATA

SAND CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Sand Creek (Continued)								
AK	13,620	609	2,547	11.8	5,189.6	5,189.6	5,189.7	0.1
AL	13,730	617	4,193	7.1	5,191.4	5,191.4	5,191.7	0.3
AM	14,210	663	3,629	8.3	5,193.0	5,193.0	5,193.1	0.1
AN	14,740	547	3,302	9.1	5,195.1	5,195.1	5,195.2	0.1
AO	15,250	547	3,121	9.6	5,196.8	5,196.8	5,197.0	0.2
AP	15,545	399	2,413	12.4	5,197.7	5,197.7	5,197.8	0.1
AQ	15,770	302	2,114	14.2	5,201.6	5,201.6	5,201.8	0.2
AR	16,880	361	3,249	9.2	5,208.2	5,208.2	5,208.2	0.0
AS	17,500	246	2,454	12.2	5,209.8	5,209.8	5,209.8	0.0
AT	18,170	248	2,830	10.6	5,213.3	5,213.3	5,213.3	0.0
AU	18,550	139[2]	1,565	19.2	5,213.8	5,213.8	5,213.8	0.0
AV	18,660	237[2]	3,020	9.9	5,218.7	5,218.7	5,218.7	0.0
AW	18,880	353[2]	2,942	10.2	5,219.2	5,219.2	5,219.2	0.0

[1]Feet above Confluence with South Platte River [2]This Width Extends Beyond Corporate Limits

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF COMMERCE CITY, CO.
(ADAMS CO.)

FLOODWAY DATA

SAND CREEK

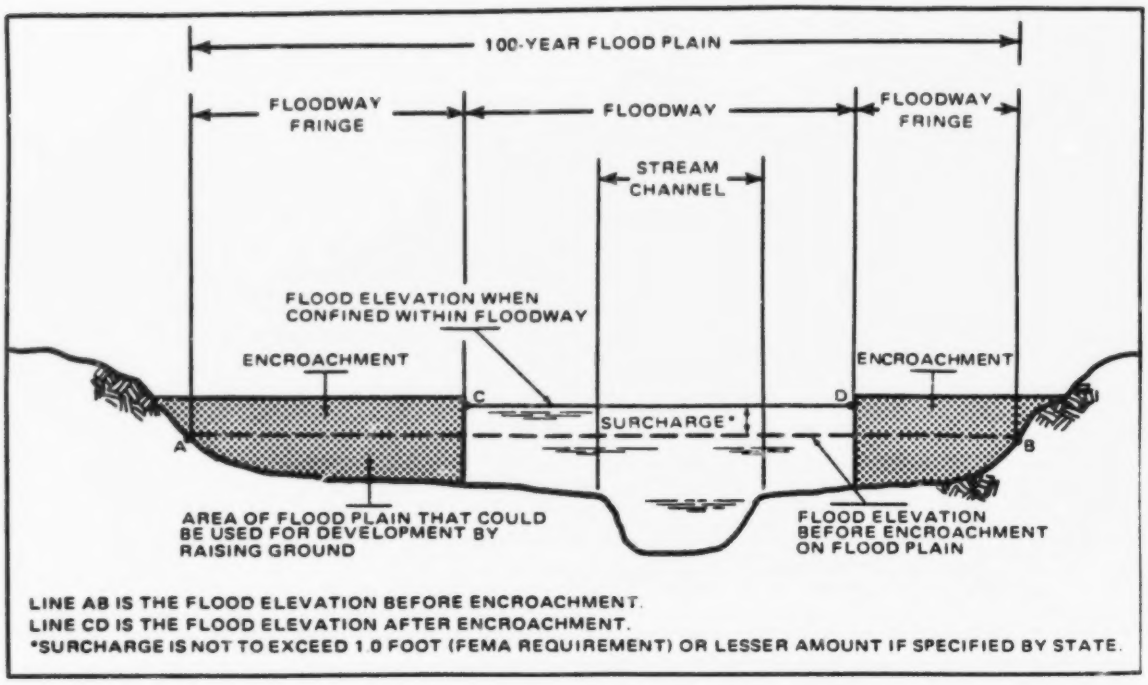
100-YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE*
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE AB IS THE FLOOD ELEVATION BEFORE ENCROACHMENT.
LINE CD IS THE FLOOD ELEVATION AFTER ENCROACHMENT.
*SURCHARGE IS NOT TO EXCEED 1.0 FOOT (FEMA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE.

Figure 10. Floodway Schematic

Average Difference Between 10- and 100-Year Floods	Variation
2 to 7 feet	1.0 foot

Nine reaches meeting the above criterion were required for the flooding sources of Commerce City. These included four on the South Platte and five on Sand Creek. The locations of the reaches are shown on the Flood Profiles.

5.2 Flood Hazard Factors

The Flood Hazard Factor (FHF) is the Federal Insurance Administration device used to correlate flood information with insurance rate tables. Correlations between property damage from floods and their FHF are used to set actuarial insurance premium rate tables based on FHFs from 005 to 200.

The FHF for a reach is the average weighted difference between the 10- and 100-year flood water-surface elevations expressed to the nearest 0.5 foot, and shown as a three-digit code. For example, if the difference between water-surface elevations of the 10- and 100-year floods is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0

feet, the FHF is 050. When the difference between the 10- and 100-year water-surface elevations is greater than 10.0 feet, accuracy for the FHF is to the nearest foot.

5.3 Flood Insurance Zones

After determining the reaches and their respective FHFs, the entire incorporated area of Commerce City was divided into zones, each having a specific flood potential or hazard. Each zone was assigned one of the following flood insurance zone designations:

Zones A6, A7, A9, A10, A12, A13:	Special Flood Hazard Areas (SFHAs) inundated by the 100-year flood, determined by detailed methods; base flood elevations shown, and zones subdivided according to FHFs.
Zone B:	Areas between the SFHA and the limits of the 500-year flood, including areas of the 500-year floodplain that are protected from the 100-year flood by dike, levee, or other water control structure; or, areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot. Zone B is not sub-divided.
Zone C:	Areas of minimal flooding.

Table 3, "Flood Insurance Zone Data," summarizes the flood elevation differences, FHFs, flood insurance zones, and base flood elevations for each flooding source studied in detail in the community.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the City of Commerce City is, for insurance purposes, the principal result of the Flood Insurance Study. This map contains the official delineation of flood insurance zones and base flood elevation lines. Base flood elevation lines show the locations of the expected whole-foot water-surface elevations of the base (100-year) flood. This map is developed in accordance with the latest flood insurance map preparation guidelines published by the Federal Insurance Administration.

6.0 OTHER STUDIES

The present official floodplain study for the South Platte River is the Denver Metropolitan Region Flood Plain Information Report, Volume I (Reference 8), which was adopted by the Colorado Water Conservation Board in 1967. Following the 1965 flood and other more recent flood experiences, as well as the construction of Chatfield Dam, the U.S.

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1% (100 - YEAR) FLOOD AND			FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION (FEET NGVD)[3]
		10% (10 - YEAR)	2% (50 - YEAR)	0.2% (500 - YEAR)			
South Platte River							
Reach 1	0005	-2.8	-0.81	1.6	030	A6	Varies - See Map
Reach 2	0005	-6.7	-2.3	3.2	065	A13	Varies - See Map
Reach 3	0005	-4.5	-1.9	3.4	045	A9	Varies - See Map
Reach 4	0005	-3.0	-1.0	1.3	030	A6	Varies - See Map
Sand Creek							
Reach 1	0005	-4.8	-1.6	0.8	050	A10	Varies - See Map
Reach 2	0005	-6.4	-3.1	2.3	065	A13	Varies - See Map
Reach 3	0005	-4.8	-1.5	1.0	050	A10	Varies - See Map
Reach 4	0005	-3.4	-1.1	0.6	035	A7	Varies - See Map
Reach 5	0005	-6.2	-2.3	0.5	060	A12	Varies - See Map

[1] Flood Insurance Rate Map Panel [2] Weighted Average [3] Rounded to Nearest Foot

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF COMMERCE CITY, CO.
(ADAMS CO.)

FLOOD INSURANCE ZONE DATA

SOUTH PLATTE RIVER - SAND CREEK

Army Corps of Engineers considers the study to be outdated. High water marks of the 1973 flood on the South Platte River supplied by the Colorado Water Conservation Board (Reference 9) were considered and thoroughly compared with the 100-year flood profile. The 100-year profile reported herein is within 0.5 foot of the 1973 high water elevations except at some bridges where the 1973 flood profile was up to 1.5 feet higher. This difference was attributed to the bridge structure blockage, which is not considered in the Flood Insurance Study analysis.

The present official floodplain study for Sand Creek is in Volume II of the study for Sand, Toll Gate, and Lower Cherry Creeks, South Platte River Basin (Reference 10) which was designated by the Colorado Water Conservation Board on March 8, 1972. A revised and updated version of this study (Reference 11) was completed by the U.S. Army Corps of Engineers and the Urban Drainage and Flood Control District in March 1977 and in the next few months is expected to be approved as the official floodplain study. This Flood Insurance Study was based on the new data developed by the U.S. Army Corps of Engineers for the Urban Drainage and Flood Control District; therefore, the studies are in agreement.

A Flood Insurance Study for Adams County was prepared by Gingery Associates for the Federal Insurance Administration (Reference 5). The maps agree exactly between the two studies. There is a slight disagreement concerning distances between physical features between the profiles of the two studies because the centerline of the South Platte River was measured using two different maps. However, cross section locations and elevations agree.

This study is authoritative for purposes of the Flood Insurance Program; the data supersede or are compatible with all previously published flood information for Commerce City.

7.0 LOCATION OF DATA

Survey, hydrologic, hydraulic, and other pertinent data used in this study can be obtained by contacting the office of Insurance and Mitigation Division, Federal Emergency Management Agency, Denver Federal Center, Building 710, P.O. Box 25267, Denver, Colorado 80225.

8.0 BIBLIOGRAPHY AND REFERENCES

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2. U.S. National Weather Service, Environmental Science Services Administration, Office of Hydrology, Special Studies Branch, Precipitation Frequency Values, October 1967

3. Denver Urban Drainage and Flood Control District, Topographic Map of Sand Creek from Aerial Photos, Scale 1:6,000, Contour Interval 2 feet: Bell Mapping of Denver (July 1974)

4. U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water-Surface Profiles, 723-X6-L202A, Davis, California, 1973

5. Federal Insurance Administration, Flood Insurance Study, Adams County, Colorado, prepared by Gingery Associates, Inc., August 1976

6. Denver Urban Drainage and Flood Control District, Topographic Map of South Platte River from Aerial Photos, Scale 1:6,000, Contour Interval 2 feet: Bell Mapping of Denver (July 1974)

7. U.S. Geological Survey, 7.5-Minute Series Topographic Map, Scale 1:24,000, Contour Interval 10 feet: Commerce City, Colorado (1965), Photorevised (1971)

8. U.S. Army Corps of Engineers, Denver Metropolitan Region Flood Plain Information Report, Volume I, 1963

9. Colorado Water Conservation Board, South Platte River, State of Colorado, Flood of May 1973, July 1974

10. U.S. Army Corps of Engineers, Omaha District, Flood Plain Information, Metropolitan Region, Denver, Colorado, Volume II, Sand, Toll Gate, and Lower Cherry Creeks, July 1971

11. U.S. Army Corps of Engineers, Omaha District, Special Flood Hazard Report to Revise Flood Plain Information, Metropolitan Region, Denver, Colorado, Volume II, Sand, Toll Gate, and Lower Cherry Creeks, March 1977

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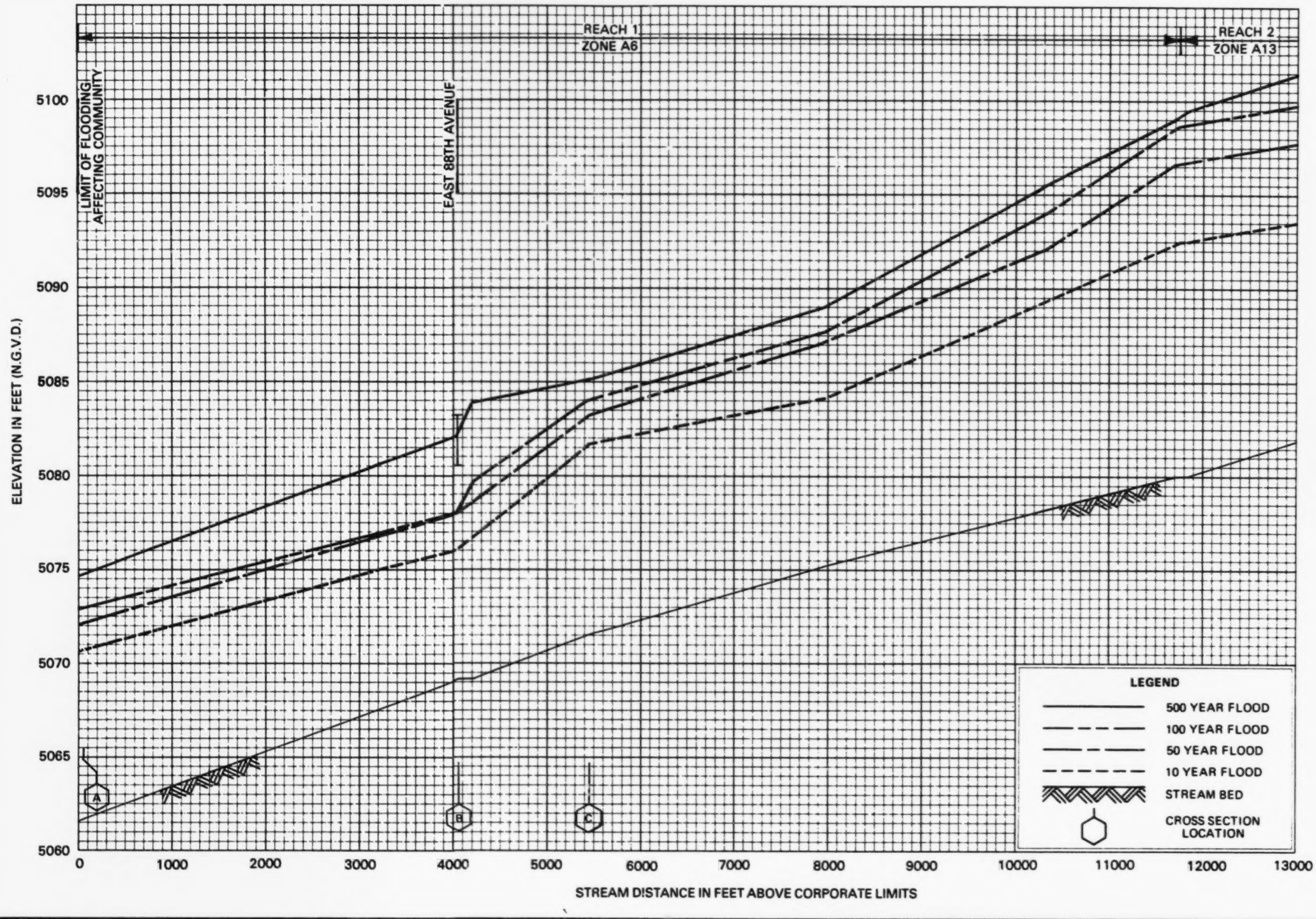
9.0 REVISIONS DESCRIPTIONS

This section has been added to provide information regarding significant revisions made since the original Flood Insurance Study (FIS) was printed. Future revisions may be made that do not result in the republishing of the FIS report. To assure that any user is aware of all revisions, it is advisable to contact the community repository located at the Department of Community Development, 5291 East 60th Avenue, Commerce City, Colorado 80037.

9.1 First Revision

This study was revised on September 30, 1988, to reflect the revised hydraulic analysis and new topographic information for the reach of Sand Creek between Vasquez and Brighton Boulevards. This information was developed by Simons, Li and Associates, Inc., of Denver, Colorado. The result of this technical information was a change in the base (100-year) flood elevations, floodplain and floodway boundaries for this reach of Sand Creek. The Flood Insurance Rate Map (FIRM), Flood Boundary Floodway Map (FBFM), Floodway Data Table, and Profile 04P for Sand Creek have been revised to reflect these changes. In addition, the corporate limits for Commerce City have been modified to reflect recent annexations from Adams County, Colorado.

The FIRM and FBFM for Adams County, Colorado were not revised at this time to reflect the annexations by the City of Commerce City. The effects of these annexations will be incorporated into the FIS report, FIRM, and FBFM for Adams County, Colorado, at a later date.



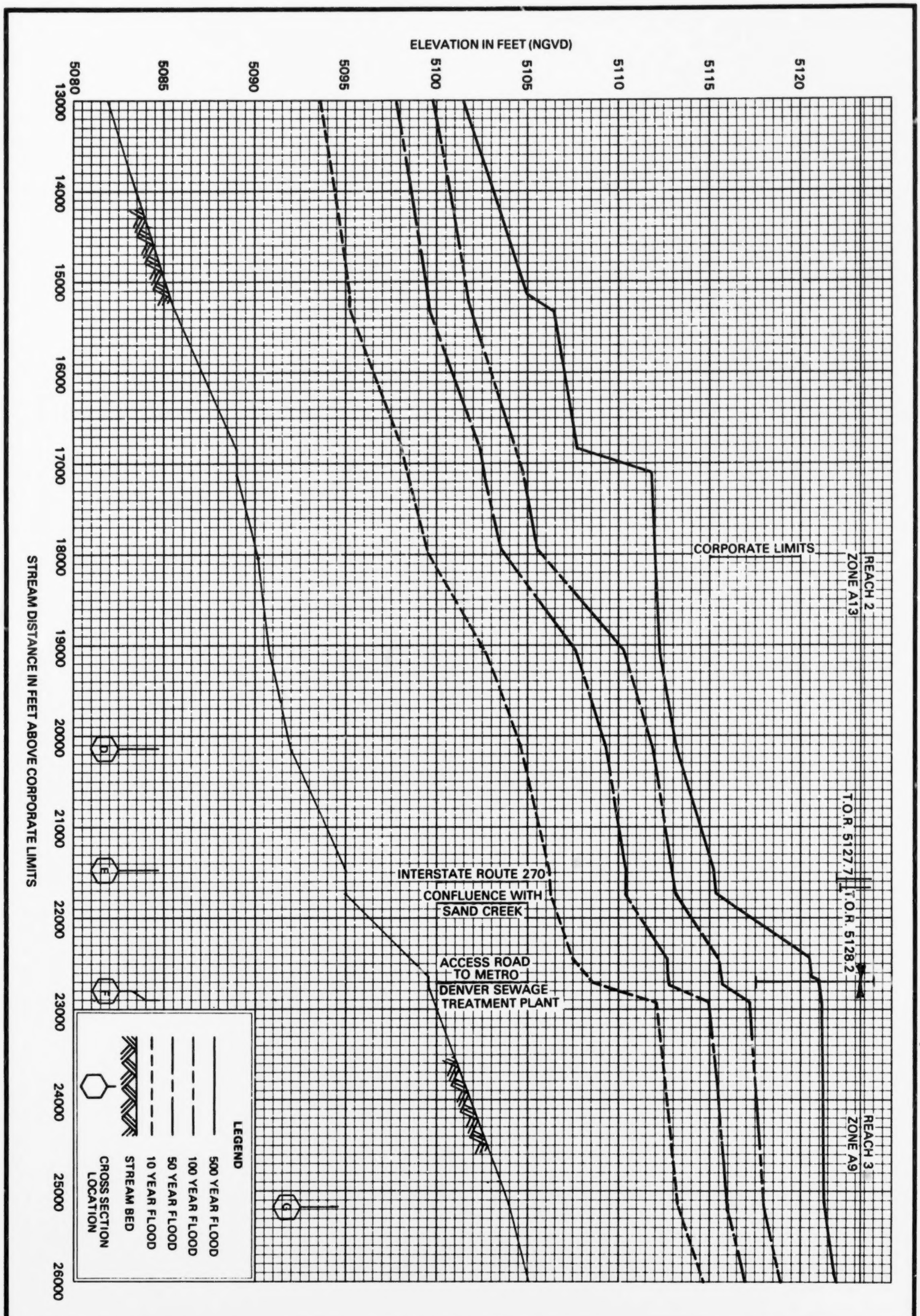
FLOOD PROFILES

SOUTH PLATTE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF COMMERCE CITY, CO.
(ADAMS CO.)

01P



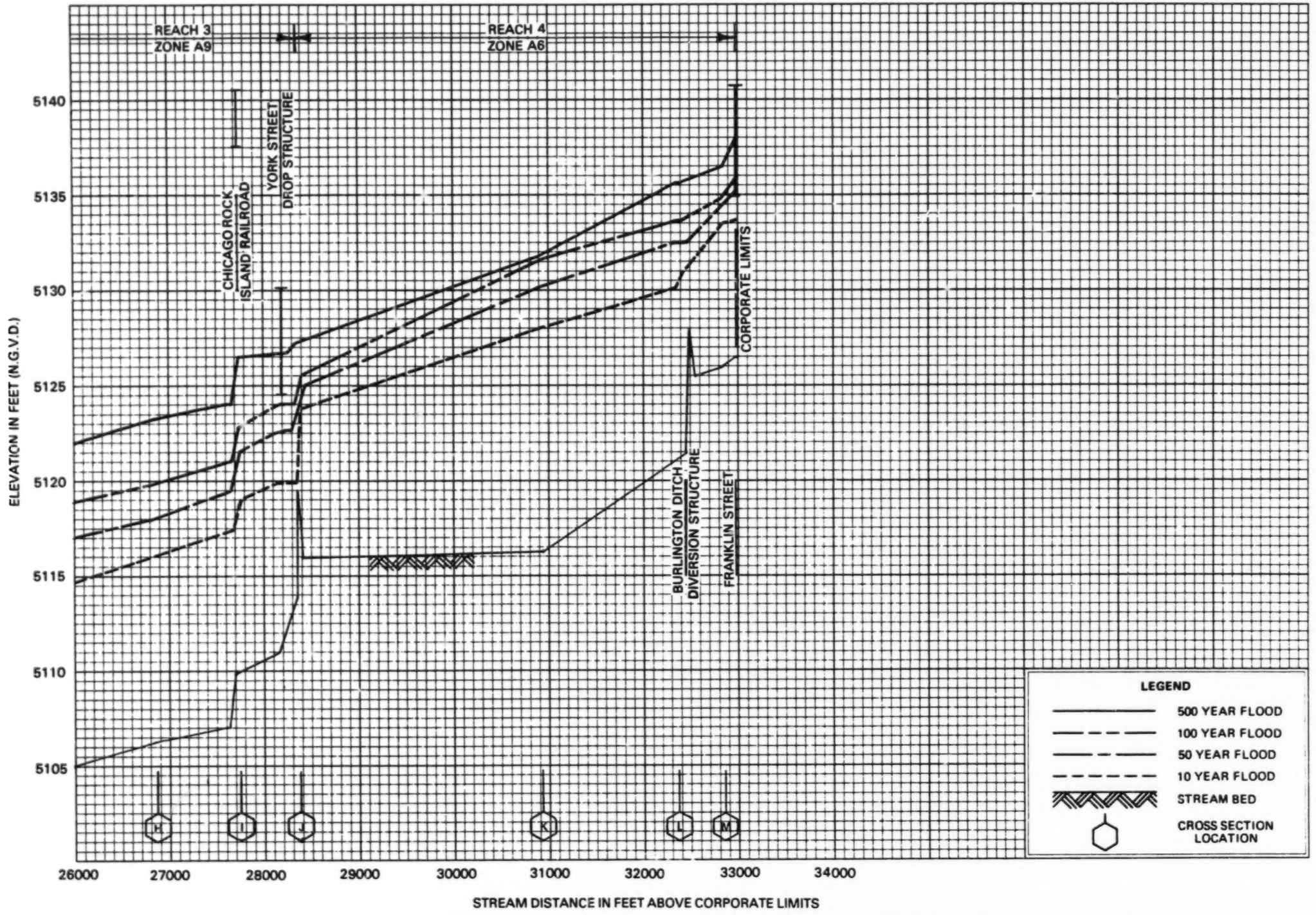
FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF COMMERCE CITY, CO.
(ADAMS CO.)

FLOOD PROFILES

SOUTH PLATTE RIVER

02P



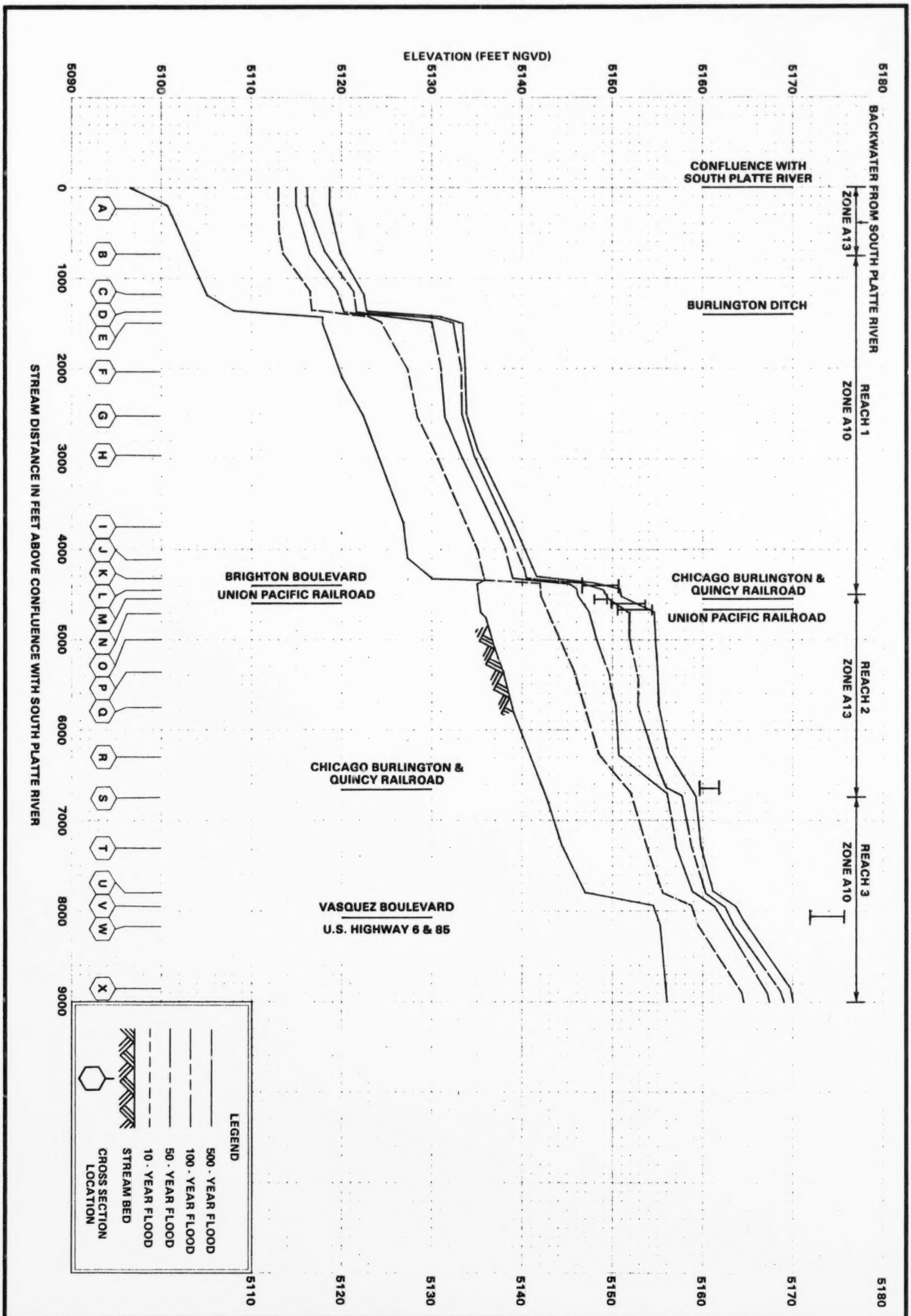
FLOOD PROFILES

SOUTH PLATTE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF COMMERCE CITY, CO.
(ADAMS CO.)

03P



04P	FEDERAL EMERGENCY MANAGEMENT AGENCY CITY OF COMMERCE CITY, CO (ADAMS CO.)	FLOOD PROFILES SAND CREEK

REACH 3
ZONE A10

REACH 4
ZONE A7

REACH 5
ZONE A12

ELEVATION IN FEET (N.G.V.D.)

5230
5220
5210
5200
5190
5180
5170
5160

DROP STRUCTURE

DROP STRUCTURE

CORPORATE LIMITS

DAHLIA ST

EAST 49TH DRIVE

LEGEND
- 500 YEAR FLOOD
- 100 YEAR FLOOD
- 50 YEAR FLOOD
- 10 YEAR FLOOD
- STREAM BED
- (A) CROSS SECTION LOCATION

Y Z AA AB AC AD AE AF AG AH AI AJ AK AL AM AN AO AP AQ AR AS AT AU AV AW

9000 10000 11000 12000 13000 14000 15000 16000 17000 18000 19000 20000 21000

STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH SOUTH PLATTE RIVER

FLOOD PROFILES

SAND CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF COMMERCE CITY, CO.
(ADAMS CO.)

05P